1,154,293

PATENT SPECIFICATION

DRAWINGS ATTACHED

1,154,293

Date of Application and filing Complete Specification: 21 Feb., 1968.

No. 8398/68.

Application made in United States of America (No. 618,675) on 27 Feb., 1967.

Complete Specification Published: 4 June, 1969.

Index at acceptance:—F2 H11A

Int. Cl.:—F 16 b 35/04

COMPLETE SPECIFICATION

Threaded Fastener

We, FORD MOTOR COMPANY LIMITED, a British company of 88 Regent Street, London, W.1., do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement: —

This invention relates to a threaded fastener and to an assembly secured by means of the fastener.

In assemblies using conventional threaded fasteners to fasten members transmitting varying shear forces thereto, only the friction between the head and nut of the threaded fastener and the sides of the fastened members resists the shear forces. Varying shear forces soon overcome the friction and elongation of the hole cross-section results. In the past, this has been prevented by using larger bolts with higher clamp forces and by carefully controlling hole tolerances.

The fastened assembly provided by this invention has a positive mechanical interference between the members and the fastener that resists the shear forces physically. An increased resistance to initial slipping of the members is thereby provided. Both decreased clamp forces and wider hole tolerances are permitted with the assembly and the assembly remains low in cost and easy to manufacture and assemble. In addition, the fastener can be reduced by a full size while maintaining the same load characteristics.

Accordingly, the invention provides a threaded fastener comprising a head and a shank, said shank having a first finned portion located adjacent the head and having an outside diameter smaller than that of the head, a second finned portion located adjacent the first finned portion and having an outside diameter smaller than the outside diameter of the first finned portion, and a screw threaded portion located adjacent the second finned portion and having a major diameter smaller than the outside diameter of the second finned portion.

It also provides an assembly secured by means of the fastener, in which a first member is located adjacent the head, the first member having a hole therein smaller than the first finned portion but larger than the second finned portion, the first finned portion being located in the hole in the first member,

a second member having a hole therein smaller than the second finned portion but larger than the major diameter of the screw threads, the second finned portion being located in the hole in the second member, and

a threaded nut threadably engaging the screw threads.

Either the fins of the finned portions or the material surrounding the holes in the fastened members or both deforms during assembly to provide a positive mechanical lift between the fastener and the members. Shear forces transmitted through the fastened members thus are resisted positively and the required clamping forces are reduced thereby permitting the use of smaller fasteners.

The accompanying drawing is a sectional view of an assembly fastened by the fastener of this invention.

Referring to the drawing, a first member 10 having a hole 12 therein is located against a second member 14 having a hole 16 therein. Hole 12 has a larger diameter than hole 16, and the holes are in substantial alignment with each other.

A threaded fastener indicated generally by the numeral 18 has a hexagon-shaped head 20 connected to a cylindrical body 22. Body 22 has a first finned portion 24 located adjacent head 20 and a second finned portion 26 located adjacent the first finned portion 24. Conventional screw threads 28 are formed on body 22 beginning adjacent second finned portion 26 and running out to the end of body 22.

The fins on both finned portions 24 and 26 are V-shaped with substantially sharp crests 24*v* and 26*v* at the outside diameter and pointed valleys 24*c* and 26*c* between them. All fins

of both portions 24 and 26 run parallel to the axis of body 22. The diameter of the circle defined by the crests of finned portion 24 is larger than that of finned porton 26 and the diameter of hole 12; similarly, the diameter of the crests of finned portion 26 is larger than the diameter of hole 16. The amount by which the diameters of the circles defined by the crests exceed the diameters of their respective holes can be up to 10 per cent of the diameter of their respective holes or even more depending on the balance desired between shear resistance and ease of assembly. These factors in turn depend on the hardness of the members and the fins.

To secure the assembly, the fastener 18 is inserted in the holes 12 and 16 to the point where the interference between the finned portions 24 and the hole 12 resists further insertion. A threaded nut 30 then is turned on the screw threads 28 and bears on the member 14 to pull the finned portions 24 and 26 into the holes 12 and 16, until the head 20, contacts the surface of the first member 10. Either the fins or the material of the members 10 and 14 deforms to permit this movement, with the deformation insuring a positive physical relationship between the fastener 18 and the members 12 and 14.

The deformation also compensates for misalignment of the holes 12 and 16 ranging in amounts up to the sum of the radial depths of the fins on the portion 24 and the fins on the portion 26. Fasteners having the outside diameter of the fins of the smaller finned portion equal to the diameter of the valleys 24*c* are capable of compensating for maximum hole misalignment while retaining maximum strength and are preferred for that reason.

During the manufacture of the fastener 18, the fins on the finned portions 24 and 16 and the screw threads 28 can be rolled simultaneously. The number of fins on the finned portion 26 can be greater than the number of fins on the finned portion 24 to permit the simultaneous rolling. In a typical fastener, the finned portion 24 contains from 15 to 19 fins about 0.030 inch deep with an outside diameter of about 0.510 inch while the finned portion 26 contains from 30 to 38 fins about 0.025 inch deep with an outside diameter of about 0.485 inch. The finned portions of grade 8 bolts having the above dimensions and 7/16 — 14 screw threads can be drawn into the members 10 and 14 with only about 5-10 foot pounds of torque. After tightening, the resulting fastened assembly withstands shear forces normally requiring a 1/2 or 9/16 inch conventional bolt.

In automative front suspension systems, a strut providing fore-and-aft stability is attached to the control arms where it is subjected to high, varying shearing loads. Prior to this invention, wear caused by the effects of the varying shear loads on loose fastener tolerances resulted in loss of the torque of the threaded fasteners holding the strut retainer to the control arm. Vibration then could loosen attachment of the strut to the control arm and result in excessive noise with ultimate loss of fore-and-aft stability.

The fastener of this invention eliminates too great tolerances and prevents torque loss even though smaller fasteners are used. In addition, a cost reduction usually results from the use of a smaller fastener.

This invention provides a fastened assembly having high resistance to varying shear loads that remains low in cost and easy to manufacture and assemble. In particular, the assembly is useful in any application where varying shear loads exist such as in the suspension systems of automotive vehicles.

WHAT WE CLAIM IS:—

1. A threaded fastener comprising a head and shank, said shank having a first finned portion located adjacent the head and having an outside diameter smaller than that of the head, a second finned portion located adjacent the first finned portion and having an outside diameter smaller than the outside diameter of the first finned portion, and a screw threaded portion located adjacent the second finned portion and having a major diameter smaller than the outside diameter of the second finned portion.

2. A threaded fastener as caimed in claim 1 or claim 2 in which the outside diameter of the second finned portion is substantially equal to the diameter of the valleys between the fins of the first finned portion.

3. A threaded fastener assembly substantially as described with reference to the accompanying drawings.

4. An assembly secured by means of the fastener as claimed in any one of the preceding claims, in which a first member is located adjacent the head, the first member having a hole therein smaller than the first finned portion but larger than the second finned porton, the first finned portion being located in the hole in the first member,

a second member having a hole therein smaller than the second finned portion but larger than the major diameter of the screw threads, the second finned portion being located in the hole in the second member, and

a threaded nut threadably engaging the screw threads.

5. An assembly substantially as herein described with reference to the accompanying drawing.

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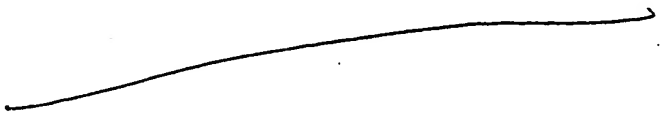
Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1969.
Published by the Patent Office, 25 Southampton Buildings, London, W.C.2, from which copies may be obtained



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1 SHEET *This drawing is a reproduction of the Original on a reduced scale*